

Abstract

Methods and apparatus for forming conductive interconnect layers useful in articles such as semiconductor chips, memory devices, semiconductor dies, circuit modules, and electronic systems. The number of necessary processing steps to form conductive interconnects are reduced by removing the need to employ a seed layer interposed between the barrier layer and the conductive interconnect layer. This is accomplished in part through the electrochemical reduction of oxides on a dual-purpose layer. The present invention can be advantageously utilized to deposit copper interconnects onto tungsten.

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